



Mitchell Institute for Airpower Studies

Presentation: F-35 in a Downdraft
Air Force Association Headquarters, Arlington, Va.

Dr. Rebecca Grant, Director, Mitchell Institute for Airpower Studies
Barry Watts, Senior Analyst, Center for Strategic and Budgetary Assessments
Vice Adm. (Ret.) Dennis McGinn, Former Director, Navy Air Warfare
Lt. Gen. David Deptula, USAF, Deputy Chief of Staff A-2

April 14, 2010

Dr. Grant: It looks like everyone is ready for this morning's discussion on the F-35.

I am Rebecca Grant. I am the Director of the Mitchell Institute here at the Air Force Association. The Mitchell Institute seeks to honor the legacy of General Billy Mitchell through timely and high quality writing and research on air power.

As you know, General Mitchell was the first real Joint Forces Air Component Commander, a feat he pulled off at the Battle of Sam Miguel in the late days of World War I in September, 1918. As you know, he was a controversial figure, court marshaled, but left as part of his legacy a tremendous cadre of World War II leaders and a passion for innovation both in technology and in the uses of air power, and that is what the Mitchell Institute seeks to honor and focus on in today's issues. And I think we could have no better issue than the one that we're discussing today and that is the role and the status of the F-35 Joint Strike Fighter Program.

Let me tell you a little bit about how we will proceed this morning. I'm going to make some opening remarks on where we stand with the program and talk just a little bit about some of the developments that have been in the news quite recently. Then our panelists will speak. We'll probably spend about an hour to an hour and a half on presentations and questions, so we're going to run a little bit longer than our normal Mitchell hour time of ending at 10:30.

Let me introduce my panel before I go ahead with my own remarks. I think they're probably all very well known to you.

The first is Dr. Barry Watts who is with the Center for Strategic and Budgetary Assessments. Barry is a retired Air Force Colonel, an F-4 guy with quite a lot of experience, and served in 2001 to 2002 as the Director of PA&E which we now know as CAPE.

Following him will be Vice Admiral (Retired) Denny McGinn. Admiral McGinn was truly there at the creation for quite a lot of the F-35 requirements definition. He will talk about its ongoing and enduring mission within the Department of the Navy. Admiral McGinn served, of course, as the Director of Air Warfare at that time on the Navy Staff, and then also later on as the Chief Programmer for the Navy I believe as well before retiring.

We will end the presentations with Lieutenant General David Deptula. I'm delighted to have General Deptula today. I think most of you know him as a fighter pilot and also in his current job as the intel, ISR, sensor, everything guy on the Air Staff, formally known as the Deputy Chief of Staff or the A2. I'm very pleased to have General Deptula with us this morning. It's great that you would take the time to come and talk to us about the F-35 in its larger context in which it will be a battlefield sensor and a critical ISR as well as strike platform. What our British friends I think quite so accurately call ISTAR.

I want to start off talking a few minutes this morning about the F-35 and where we stand with this particular platform. I think it's important that we keep in mind a little bit of the big picture. All the Pentagon's recent moves have been focused primarily on one goal, and that is getting the F-35 on track to produce program of record 2,443 aircraft for the U.S. and several more for program partners as well.

Dr. Carter has made some remarks about the F-35. One stuck out in my mind, and this was from his testimony last month. He said, and I quote, "None of these reviews discovered fundamental technological or manufacturing problems with the JSF program or any change in the aircraft's projected military capabilities."

I think as we discuss the in's and out's of where this program is at a very critical juncture in its life span, it's important that we remember what we're not talking about. We are not talking about a significant move away from the F-35 as the backbone of the combat air forces across three services in the United States and in several partner nations. We are not talking about a major problem that has arisen with design, with manufacturing, with flight test. We are not talking about any assessment of a failure to ultimately deliver this tremendous aircraft. And quite importantly, we are not talking about a diminished strategic need for the F-35.

I would contend that our strategic need for it probably has never been greater. Several things have made this come true. One was the end last year of F-22 production. As we know, F-22 is continuing to roll off the line, but the production was terminated at a far lower level than Air Force plans originally called for. This has made the successful development of F-35 just that much more critical.

Quite recently in the news Russia claims to have tested a stealth fighter. I doubt they define it the way that we do, but we know that PAC-FA Shows a press towards advanced fighter technologies. We also see China continuing with its engine enhancements and other steps on its path towards developing advanced fighters. This means that F-35 is by

no means the last fighter or the only one out there, it will eventually take its place the fleets of the world and there will be contenders and there will be other aircraft that will contest for air superiority.

Beyond this, air operations in Afghanistan are daily proving the need for air in support of the ground scheme of maneuver; for air in support of the melded information, strike and reconnaissance. I won't go into that because I know that General Deptula and our other panelists will discuss that in some detail. But if we see anything from the lessons of the Balkans, of Iraq and Afghanistan, it is that our joint force and our land component is more dependent than ever on the appropriate relationship with air power and the delivery of air effects right across the spectrum from ISR to strike to the mobility aspects that we see.

F-35 will walk into this joint force with high expectations for what it can do for the ground forces and it will be prepared to deliver on that.

We also are not certain what the future conflict environment will be like. I had the great privilege of being in Australia about two weeks ago and there Chief of Defense Air Marshall Houston warned of the relative rise of India and China, something widely discussed in the their defense White Papers, and also about the prospective relative decline of U.S. interest or U.S. commitment to this region. He said that we are seeing a series of events that we have not seen unfolding in the last 60 years.

I think what this shows us is this tremendous strategic view of a world where the nature of conflict will change and where the allied partnerships that F-35 represents and will underwrite will be more important than ever. We simply can't take our future adversaries for granted. We can't assume the availability of air superiority. And we are counting on F-35 to deliver the air power effects that all our joint and coalition forces have come to depend on.

Finally, we know we have serious economic and security challenges that make it more important than ever for the partners that are leading air forces in the world to continue this partnership in planning for their future capability.

Now some specifics about the F-35 program itself. We have seen in 2010 the unfolding of a series of events that really began I think most critically back in about 2006. I just want to make a few points on where we stand with the status of the program, and I'll preface those remarks by saying that these are very broad. I think we see that both from the Joint Program Office, from those in OSD concerned with the management of the program, and of course from the contractor team, we see an intensive effort to look at where the program stands, to understand what the path forward will be, and it will be some time before we have all the answers that we want. It will be some time before we know if flight test is truly on the schedule to produce at the rate that we are hoping it will. It will be some time before we know the realities of price. And some time before we know if we have full confidence in executing the schedule.

But having said that, I think that we are not at all looking at the tip of an iceberg. This is an iceberg that is 90 percent above the surface at this point, and the recent Nunn-McCurdy breach notification is the real signal that we have now rounded up several years' worth of problems and challenges on F-35 and DOD is outlining a plan to move ahead with them. Now why would I say this?

The fact is there has been growth in the cost of the program. It has been related to a series of changes. Most of them are things that you are familiar with. One of these were challenges in managing STOVL weight reduction and design. Other challenges in airframe. Other challenges in propulsion. And yet, increased propulsion costs.

The fact is that by 2006 the F-35 program had already reached a point of about 38 percent growth in its cost. The Nunn/McCurdy critical breach level, as you know, is 50 percent. So in a way what we're saying is that 75 percent of this happened three to four years ago and stretching back into the earlier days of the program. We related very much to the process of shaking out the design coming from the 2001 decision at Milestone B and contract award, of shaking out that design and moving forward.

To me, this is mixed news. Is it something we wanted to happen? Certainly not. But the good part of this is that it signals a relatively strong level of transparency about what has caused the cost growth and the fact that that cost growth is not on a continued upward spiral but is something that has most likely plateaued and come into a manageable OEM.

The specific decision that pushed the F-35 program over the breach threshold stem, I would say, from one principle cause, and that is the decision process that began in late 2009 in the Department of Defense to fund F-35 conservatively. You have all read about the jet estimates, Jet 1, Jet 2, impact on schedule, impact on cost. I think they boil down to over-simplifying to saying that money into the program and across the FYDP jets out as the program has been rebalanced to reduce what OSD perceives as the significant portions of risk remaining in the schedule. That's going to result in the reduction of about 100 aircraft, maybe a little bit more, over the FYDP.

Here again I think Dr. Carter has hit the nail on the head when he said that this is disappointing, but it is a fact of life.

Imagine what would happen if the decision had not been made to act conservatively on the part of DOD. I think what we're seeing is a case where we have some unknowns in the production schedule, a series of different estimates, and the prudent decision has been made to put money in, take jets out, and achieve a program that has less risk.

Again, we are not going to know for sure that that has happened for a certain period of time.

This leaves one of the remaining issues of I'd say really probably three remaining issues, and with this I will wrap up my remarks. One is the question of concurrency. We could spend the rest of the day, probably the rest of the week discussing the in's and out's of concurrency, how you procure aircraft, how you attempt to do so economically, and particularly how you do so on a program of this magnitude and with such importance. But I think it's more important to stop and say all right, where are we now with the issue of concurrency?

Let's remember a few things. Aircraft procured so far fall into two batches. STD aircraft, and then the lowered initial production aircraft. These aircraft are purchased initially as test assets. They go into the combined test force; they'll flow out eventually others into operational and developmental test, so these are test aircraft, not the go to war aircraft. Some of the [OF] aircraft will participate in this as well. So what we see is that these are aircraft that are not necessarily robbing the services of needed training and initial squadron aircraft, but are set aside for test.

This is not to minimize the fact that yes, there will be a large number of aircraft on contract prior to the conclusion of operational test and evaluation, but what it does say is that this has long been the plan for this program, that it would produce a relatively high number of early assets, and herein lies the concurrency.

So I would say this takes out a major portion of the concurrency risk. It does leave in some risk, and that risk resides in one area. That is to what extent the services may in future choose to modify early production aircraft either for sustainability reasons or to enhance combat capability.

All of you who are familiar with fighter or combat aircraft production or Predator or Reaper production know that block upgrades are the way of life. It's necessary to add enhanced capabilities across the lifetime of the system. This is essentially what will also happen with F-35. So is there some financial and decision-based risk remaining in the concurrency? Yes, I would say that there is. Is it an insurmountable or unacceptable risk? I would say no, and particularly compared to the risk of the only alternative which would be to dramatically slow down production. What would happen in that case?

Well, you would have a full manufacturing facility ready to ramp up and essentially idle. So to take the most simplified analogy, we need to go ahead and produce these aircraft, paying the cost for labor, and we all know that payroll is the biggest cost in any business; paying the cost of manufacturing and production. You can produce them on schedule at a certain cost or you can simply pay all those people to stand around and do their jobs more slowly and pay additional costs. So we are not at a point where there is a choice about concurrency at this stage. There has already been some reduction, as I mentioned previously, to the number of jets produced across the FYDP. We are in a situation where we need to understand, found and manage the concurrency risk, rather than to continue to debate whether this was the right acquisition strategy.

Two more points I want to make before I turn it over to my panel. One is the question about price. A price estimate was essential to determining whether the program had crossed the Nunn/McCurdy threshold. Therefore, DOD released figures that have been widely cited and widely quoted on the estimated costs per unit for the F-35 program going forward.

Then the complicated part comes in. One must pay very close attention to whether those costs are quoted in 2002 dollars or in then year dollars and so on and so forth. So I'd urge all of you looking across this to be very careful about the numbers that are being used.

Secondly, what we have in terms of cost are budgeted costs, estimated costs, and then we have a couple of actual factual costs. The only costs for the F-35 that we really know are those that have been negotiated between the contractor team and the United States government in the initial system development and design contract, and more relevantly, in LRIP or Low Rate Initial Production. What we see in the first three lots of LRIP, which have been priced, is that the prices are coming in lower than the negotiated targets when GFE is excluded.

Now the actual numbers are eye watering because they are in the three figure millions because they are aircraft early on in the program. But the important point of this is the trend. We are seeing a downward trend and a trend going below negotiated price. That is highly significant, and an indicator that I would urge all of you to continue to watch as we look at pricing on LRIP-4 and LRIP-5.

Also, let us not make the mistake of thinking that these LRIP prices have any bearing on what the final contract prices will be once economic order quantity production is underway. This also affects prices that services and allies may pay in future lots being produced towards the end of this decade. We don't in the end know those prices until they go on contract.

So a lot of uncertainty revolving around price. We know, as I said in my opening remarks, that the program costs have increased. We know that most of those increased costs are now in the past, and we know that they have been enough to trigger a significant breach. What we really don't know is how this will look going forward much beyond the LRIP costs that are being negotiated now and much beyond the FYDP.

Even the case of then year dollars, which are often used to price out the total ownership costs of a program, is becoming a little bit more complicated. Due to economic conditions, our inflationary rates and tables are not what they were ten years ago. We can't simply assume a steady inflationary rate and therefore end up with a realistic then year dollar figure. We have actually looked at a near zero inflation rate across 2008. So simply put, it's very very hard to estimate with any degree of statistical accuracy where these costs will end up.

I want to talk about just one more thing because I think it's a crucial indicator that we need to watch in the program. And that is flight test. You've seen it widely reported that the flight test program did not meet its goals for the number of flights in 2009. What's more interesting to me is that there are quite ambitious goals set out for 2010. The F-35 program hopes to complete over 500 flights total by December of 2010. Some of those have already been flown. First quarter tracking of these flights is about on target. If you add it up, they're a couple of flights ahead. One month was a little behind, one month was a little ahead, in almost anything you want to see. What's key for the next three quarters of 2010 is that there's expected to be a significant increase in the number of F-35 flights. This is coming for a couple of reasons, one of them being the additional delivery of aircraft to put into this test program. I would urge that we watch very closely to see how that progresses, for that will tell us a lot about the ability of the program to move on its current pace through SDD and into the operational test and development.

Beyond this we will see some significant events with the program this year. I'm not sure that any one of them will tell us that all is well with F-35, but taken together they should give us by the end of the year a much better sense of the status of the program. Among these will be a carrier-based version, its first flight, an initial software delivery into the test force, and I think we should also watch for what I'd like to call management vigilance. We've seen a change of leadership happen in the Joint Program Office. I think we all feel that Admiral Venlet [Vice Adm. David Venlet] is superbly qualified to lead this program going forward. I imagine that we will see within all the contractor teams and right perhaps down to the touch labor production line a real effort to make sure that all is going as it should. We should also expect to see continued management vigilance from DOD and from the services who are the principal customers for these early aircraft. We want to see this level of scrutiny and we should be comfortable that that is what is needed in this program at this point in time in order to get it on track.

I would expect to stand up here perhaps a year from now and have a much better indication of the program status of F-35. Everything we have seen today suggests that there is a conservative approach taken to ensure that this program remains what it was designed to be — the backbone of our combat air forces.

With that introduction I want to turn it over to Barry Watts, then to Admiral McGinn, and finally to General Deptula. Thank you.

Dr. Watts: Thank you very much. It's a pleasure to be here again at the Mitchell Institute. I want to thank Dr. Grant for inviting me. I didn't bring any slides today, and I will try to be as brief as I can so we can stay close to the planned schedule.

Let me begin by going back a year, to last April, when Secretary Gates made a number of programmatic decisions prior to the completion of the Quadrennial Defense Review that came out more recently. I'm just going to touch on a few of the choices that he announced in that initial look at programmatic issues in the Department of Defense. One was to cancel the next generation bomber; as Rebecca's already mentioned, ending

F-22 production at 177 airplanes; and it was his intent, he announced in a press conference about a year ago, to accelerate production of fifth generation F-35 which he said in his statement could be produced in quantity and at sustainable cost.

Much of what Dr. Grant was just discussing reflects the fact that there have been some problems with cost and schedule since he made those choices back in April of 2009. I'm not going to get into cost and schedule at all, I think it's been dealt with reasonably adequately, other than to make one observation. When Jim Roche was Secretary of the Air Force and subsequently, he has repeatedly beat in my head about the fact that his guess going forward was that in the end the JSF was going to be as expensive as the F-22. Now mind you, these comments were made when he was pushing for more F-22s than 187. I would just observe at this point that if you look at the recent selected acquisition report information that has been made public on the program in detail, it appears that the program acquisition unit cost is still well below the F-22s which became very high because, of course, of the small number of airplanes that were bought, which means you've got to spread that fixed R&D or development cost across far fewer airplanes than the Air Force originally intended. The procurement unit cost, however, is beginning to get up in the vicinity of the F-22.

If you look at the SAR data it looks like about \$90 to \$110 million in FY09 dollars right now. That's the range that the Pentagon has put forward at this point.

With that brief look at cost and schedule, things of that sort. I want to turn to more longer term strategic observations about the program.

The decision to end F-22 production at 187 airplanes was a fairly consequential decision in the following sense. It meant with respect to the future of tactical fighters, as I used to call them, combat aviation, we put all our TacAir eggs in one basket — that's the F-35 program. If the Air Force hopes to replace, for example, its aging F-16 inventory as well as the A-10s with fifth generation, all aspect, low observable aircraft, you've got to hope this program succeeds at the end of the day because there just aren't any other options.

I'd just mention Representative Skelton, Sidney Freedberg, in a recent article that he published, the title of Sidney's article was "Betting the ramp on the F-35", and that's where we really are right now, today.

I will just comment, however, that once those choices were made and we got all the TacAir eggs in the F-35 basket, and you look at a program which is probably going to end up being, if it goes as currently planned, the largest acquisition program in terms of the total number of amount of money invested in it in the history of the Pentagon, probably over \$320 million in then year dollars, it becomes inside the Pentagon the juicy orange that everybody would like to take a programmatic bite out and get some money for their own programs. Consequently there have been a lot of things said, even floating around in the Pentagon for military officers, I guess I would put it bluntly, bad-mouthing the program on the basis of information that wasn't entirely factual or true. I

hope we can sort of start to walk away from that.

Okay, I want to talk about another issue very briefly, and we're not going to be able to get to ground truth on this particular one, but there are certainly individuals wandering around who want to talk about the era of stealth being over in the foreseeable future. I have a very close colleague from my days in the Office of Net Assessment who's been doing future oriented wargaming up at Newport. His briefing refrain relative to this is that in the near future the SAMs, surface-to-air missiles, are always going to win. Is that right?

Well I can't in an unclassified forum really give you a definitive answer, as you might guess, but I will say this. The firm commitment of Secretaries Gates, Lynn, Carter, Donley, and a bunch of people in the Pentagon to stand behind this program, restructuring it, and go forward, implies to me that they believe that stealth still has a future and is going to be militarily important. How far out into the future? The end of F-35 production for the Air Force goes out to FY2035. So if you're behind this program and you're making a huge investment in all aspect LO combat aircraft, the implication is we think stealth is not going to completely go away as a valuable commodity at least into the 2040s.

I mentioned that one of the programs that got canceled last April was the next generation bomber. Another concern I have in a broader sense, looking beyond just the Joint Strike Fighter, is that it's a short range platform. And Secretary Gates has repeatedly and I think correctly argued, this is from a speech he gave in late 2008, that "The emergence of growing anti-access area denial capabilities, particularly in the Western Pacific, perhaps in the Middle East, are going to put a premium on our ability to strike over the horizon and will require shifts from short range to longer range systems." The obvious observation to make from a big picture standpoint is if you look at what we're buying right now, we're buying short range platforms. We aren't really doing much in the way of any kind of long range strike platform that can penetrate beyond the B-2.

Instead, we're studying exactly what it is we might want to procure for something like the 24th or the 25th time since the Air Force started looking beyond the B-2.

I'd also mention in passing, and this goes much beyond just bombers and long range things versus fighters and short range things. If you read the recent Nuclear Posture Review, it like the one in 2001 said one of the ways we are going to reduce our dependence on offensive nuclear weapons, per se, or deterrence, is to lean more heavily on conventional long range strike, and the fact of the matter is there programmatically isn't much of a horizon that you can see to suggest that we are actually doing anything there.

I want to touch briefly, and this is sort of a revisit of some history on the 2443, which is the program of record in terms of how many American F-35s are supposed to be

procured by the end of this program in 2035. After the F-22 production was capped at 187 airplanes, I went back and asked myself, look, there have been four all aspect low observable combat aircraft programs that we have invested money in. The F-117, the B-2, the ill-fated ATA, Advanced Tactical Aircraft which became the A-12, and was supposed to replace the A-6 in the carrier air wings, and of course the F-22.

The question was, at the beginning of those programs how many airplanes did the services plan to buy? Now a caveat I must register. All those programs were started before the Cold War ended, and one would assume that the numbers that the services came up with and envisioned looking at a Soviet adversary should have come down somewhat — 30 or 40 percent as we went into the peace dividend period [inaudible]. But the answer to the question as to how many of those four programs originally were envisioned to buy, was 2,778 airplanes. That's larger even than the planned JSF line. The next question, of course is, so how many did we really buy? I'll just pause for dramatic effect here before I give you the answer. It's 267 airplanes out of almost 2,800. So there is a history here relative to the planned buy of the JSF which says to me something like we have spent huge amounts of money developing these kinds of combat aircraft and we have procured pitifully few, I think I could suggest at this point in time.

B-2 and F-22 will log at least \$45 million, maybe more. We've got a similarly large bill for the JSF. And while this is sort of a case study in spending a lot to develop things and not buying very many of them at the end of the day, it's reflective of a broader trend in defense acquisition, which is as follows. I went back and looked at an eight year period covering the Vietnam War and compared procurement funding in the Department of Defense budget with RDT&E investment. The ratio was about three bucks for buying stuff for every dollar we spent on development. That ratio the last eight years, ending in 2009, is down to about 1.4 to one. So my interest in raising doubts about how many JSFs we're really going to buy in the end, that particular historical example is a reflection of a broader trend in procurement, acquisition, development in the Pentagon. I hope it's one we're going to be able to reverse.

The Joint Strike Fighter, actually, if the program goes forward pretty much as currently planned, may be the first significant break with that historical trip, and that would be a good thing I think.

It would also represent for all the services finally a serious commitment to all aspect Low Observable Combat Aircraft as the mainstay of their fleets. We haven't really gotten there yet.

Finally, I'll just touch on a couple of advances that I see in the design of the Joint Strike Fighter. I could say revolutionary, but I'll refrain because that's a difficult word to defend. One of those, LO maintainability. If you know anything about the 117, the B-2 or the F-22, let's take B-2, where if we actually had to pull panels off that didn't normally come off back in the beginning of that program after it was in operational service, there were like three different caulk and curing processes that you had to go through to put

the thing back together with tapes. The F-22's got tanks, and so on and so forth.

The long and the short of that is that LO maintainability has been a real problem, and from what I've seen going out to Fort Worth, talking to program people involved in the Joint Strike Fighter and actually looking at some of the surface materials, I think they have actually solved the problem of developing outer surfaces for the airplane that no kidding, you could take a ball peen hammer and beat on them, and it doesn't affect the RCS of the airplane. So I think LO maintainability is going to be a feature of this airplane we haven't had in past jets of this sort and it's a significant step forward, particularly in terms of life cycle costs.

An open avionics architecture. This will be the first platform that we've built with that kind of an architecture. What am I talking about?

When the B-2's avionics was sort of finalized back in the mid '80s they picked Intel 286 [Notarized] Processors. As I have said in public forums before, if you had a 286 laptop and wanted to give it to your local lending library they wouldn't take it because it doesn't run Windows. That's how far back in terms of Moore's Law, which is basically talking about predictions about every two years, the processing capability of your state of the art processors doubles.

What they did with the JSF was build a Central Information Processor with a bunch of cards with processors in them, and the intent, which they have demonstrated in reality, is to be able to just pull those cards out, put in new ones with more advanced processors, and all the software still runs. That means incremental avionics upgrades over the life of the airplane should be far less expensive and far easier than they were in the past. And again, I think that's a significant step forward.

Lastly, and I'm sure General Deptula will talk about this. The sensor suite in the airplane and the huge amount of computational power that's available, will give this platform for the first time an ability in real time to recalculate [BALUA]. What am I talking about here? If you go and look at 117 missions or B-2s, low observability doesn't give you invisibility to air defenses, particularly to radar guided SAMs, so you have to stay far enough away from them so that you don't burn through and get hammered as one 117 did back in 1999. Basically those routes relative to the defenses that we were aware of had to be carefully planned prior to the mission and it was just about impossible to deviate significantly from them.

This airplane's going to be able to do that in real time and that's going to be a tremendous operational advantage for the platform.

I will end there and just say, I see Tom Ehrhard witting in the back of the room. He and I have had a lot of discussions about this program. I'm still fairly bullish that we're going to get some good jets out of this thing. I know not everyone is. I know there are a lot of people in the building who would like to take funding chunks out of it. But as I say, I am

still pretty much bullish on the thing.

Thank you.

Dr. Grant: Thank you.

Vice Admiral McGinn: As Rebecca is getting the slides up I just wanted to say how happy I am to be here at the Mitchell Institute with this esteemed and knowledgeable group to talk about the Air Force tanker replacement program. [Laughter]. I say that right up front because if you think this program is controversial, this is nothing. [Laughter].

I also want to point out that it's great to be coming back to a subject and a forum on tactical aviation, and in order to make sure I get it right, the Navy has sent my very own truth squad — Mark Demo and Rich Thayer, John Cotton — all here that we've served together and they know all the stories and if I say anything wrong they'll let me know, absolutely.

I want to talk about the vision. Where it came from, where it is now. Obviously we focus on the problems of the program, but I also want to talk about the why, the compelling operational requirement rationale, especially from the Department of the Navy, Navy and Marine Corps aviation perspective. I know that Dave Deptula is going to cover not just ISR but the Air Force's compelling rationale, so that's the whole purpose of this briefing, and then I look forward to your questions.

Next slide.

The next generation family. That's important. It's a family across the services in the United States; a family across international coalitions. That is really, really a key.

It's going to have F-16, F-18C, D, like air performance. Good stealth, low LO signature and counter-measures, much needed in survivability. Advanced avionics. Dr. Watts mentioned that before. I'll talk about that in just a minute in a mission perspective. And adverse weather precision targeting. Increased range with internal field weapons. Very very important because of maintaining the LO characteristics, but it has advantages for endurance in various mission scenarios and range that other aircraft with external carried ordnance and fuel don't. And highly supportable state of the art prognostics and help management. Really key to looking at the overall life cycle cost. Okay, once you get it, it's going to be there, it's going to have these characteristics. What's it cost to own it? What does it cost to operate? I think in this regard the program offices, government as well as Lockheed Martin and their supporting team of contractors, are really trying to learn as much from previous lessons learned, other aircraft that are out there today, including things like F-18 and F-22, so that they can improve the life cycle ownership of this.

Bottom line, it's going to be lethal, survivable, supportable and affordable in a life cycle sense.

Next please.

For the Department of the Navy, what the Navy was looking for, multi-role, stealthy strike fighter to complement the F-18E/F. That was a word that we used way back when. I'll talk about a little bit of history here very briefly. But it was back in 1996-1998 timeframe. We've got three tactical aircraft programs — The F-22, the JSF, and the F-18E/F and we can't afford having three, so which one has to go? So the Navy approach was look, we're not trying to jump whole hog into the Joint Strike Fighter. It was very early back then. But we wanted to make sure that we had a strategy and a vision for why we would want to continue the design and build of the F-18 Super Hornet, and at the same time say look, we're looking over the horizon, we want to figure out how best to use the Joint Strike Fighter as a complement to overall sea-based aviation.

Marine Corps. Multi-role, Short Take-Off Vertical Landing strike fighter to replace F-18C/D and the Harrier.

A key point, third bullet, Don, CV STOVL mix is TBD. Bob Magnus, a retired ACMAC and I, were doing a lot of work about eight years ago or so and talking about the Navy TacAir compatibility or interoperability study. As a result of that we want to really create, we wanted to really create as much flexibility between Navy aviation as we possibly could while still maintaining key core competencies and cultures of both of those essential parts of our air force. So that is going to be something we're going to be looking at depending on operational scenarios, depending on the delivered aircraft capabilities and where we can best get the use out of it.

Requirements document. The famous JORD signed in '00, before 9/11, more than ten years ago last month. Changes, three of them in '01, '03 and the most recent in '08 respectively. This has been a really, really good process.

If I could have the next slide, please.

This didn't just fall off the turnip truck, as they say, as a program. September '93 there's a bottom-up review and the concept was this thing called JAST, Joint Advanced Strike Test. It was basically an avionics program or capabilities program that you could theoretically throw into a variety of airframe engine combinations and it would really give you great capability. That was a formally established program in '94, 16 years ago. '96 it was actually, hey, we're kidding ourselves if we think we're going to displace an existing airframe engine combinations, these new capabilities, with advanced systems, so it's going to have to be not just the capabilities but the airframe and the engine built around it and it became the Joint Strike Fighter Program.

In May, two months after that was established, it was designated an ACAT-1D and then

we started a process, Paul Kaminski was AT&L back then, and I remember serving on a panel that met in secret on a lot of occasions, and we basically were trying to whittle down the potential bidders for the, to get down to the final two, this kind of winnowing process. And I remember that we had, at that time, to let you know how long ago that was and how many changes have taken place, there was this company called McDonnell Douglas. It was Lockheed Martin pretty much as we know it today. There was Boeing. Boeing. They make jets. And yeah, they used to make some combat aircraft way back when. The '50s I think was the latest time, certainly before then. Then what a lot of people don't know is there was a fourth bidder, potential bidder on this. I can remember sitting around a table with my Air Force and Marine Corps counterparts led by Paul Kaminski, reading through literally a handwritten proposal that some fellow thought he had the best idea for this program, and he actually put in a formal bid, all handwritten. Pretty impressive. He didn't make the cut. But what did were the two finalists, if you will — Boeing and Lockheed Martin.

McDonnell Douglas, the maker of Joint Strike Fighters — the Harrier, the Advanced Harrier, as well as the F-18C/D going to the E/F, fell off the truck for a whole bunch of reasons, and all of a sudden a couple of months later Boeing subsumes McDonnell Douglas and we have the final two competition and you can see the one that didn't win, I think it just lost on plain old ugliness. No insult to the airplane designers or the treat people at Boeing at the time or now, but just that big old intake scared the heck out of me, and I'm a guy who flew A-7s for many many years, so I'm used to big intakes, and a little bit ugly airplanes.

Finally, down select, Lockheed selected nine years ago as the SDD prime contractor and full SAR reporting commenced a couple of months after that.

This program has been around for a long time. The Department of Defense was spending money on the program even back then. Time times jobs equals program cost. And the fact that we were really aiming high in terms of a, from the get-go, a joint,

Joint Strike Fighter that was going to be meeting the needs of Air Force, Navy and Marines and our international partners, pretty significant. And it was going to be low observable. And it was going to have the best capabilities for a very very big and high standard to meet.

Next please.

For comparison purposes, you see the Air Force variant, the so-called CTOL, Conventional Take-Off and Landing capability and its characteristics over on the far right. The key attributes column on the left apply to all of these three U.S. variants. Then next the Marine Corps variant, the so-called STOVL. Short Take-Off Vertical Land capability. Finally the CB or carrier-based airplane.

You can basically see the biggest difference in these are weight slightly more for the

beefed up carrier version, and a reduction by design, if you will, by necessity, but fully acknowledged by the Department of the Navy and the Marine Corps for the STOVL. You don't get anything for free. If you want to be able to go Short Take-Off and Vertical Land, which in the Marine Corps concept of operations is absolutely critical, you need to give up something and the challenge there was how much range and how much payload do you potentially give up for having that capability. Which gives you, the benefit to that cost is a tremendous amount of flexibility.

Next.

General Deptula will talk about this I'm sure, Barry mentioned it as well. The whole idea is to either avoid the threats by knowing where they are and where you are through a whole variety of multi-sensor integration. It reduces the number of airplanes on a particular mission to get the job done, whether it's maintaining air superiority or going after high value targets or close air support, and low support requirements in terms of other airplanes and other assets that you have to have in order to achieve the levels of lethality and the levels of survivability that Joint Strike Fighter is going to do. And obviously absolutely crucial, low attrition.

So a key point here. Synergy of the low observability or stealth, the situational awareness, and joint strike fighter — strike and fighter capability — gives you tremendous operational flexibility and capabilities.

Next please.

Day/night capable. You can see the whole array of acronyms up there that General Deptula is going to go into in a little more depth. The key point is it gives it an amount of autonomy and all-weather capability at very very long ranges for tactical airplanes that we have not seen in the past.

Next.

It does it, obviously, through this multispectral fused sensors that allow you to really take advantage of the best technologies that are out there and coming down the line. Tremendous computing capability on-board and off-board, and it creates that holy grail of system of systems capability that we've been wanting to achieve in many other programs. This one actually will be able to do it and it gives it tremendous capability.

Next, please.

This is really key. We go to war in coalitions and we value the interoperability that we have with our coalition partners. To have interoperability with this kind of a capable platform is going to be an international or a combined force multiplier that we've never seen before. You can see that the replacements for existing aircraft out there that have some compatibility, very very stovepipe approach in many cases, but with the Joint

Strike Fighter as a common platform with many of the same common avionics, tremendous synergy is achieved there.

Next.

Before I get to your questions, I'll do that after General Deptula's comments. I just wanted to comment. Rebecca has it exactly right on the three key challenges. If you haven't seen her article in Naval Institute Proceedings of January, I believe it was titled "All In". I haven't been to Las Vegas for a while, but I know that "All In" has something to do with poker. [Laughter]. There was the other article that was mentioned about betting the ranch or betting the farm. It all has to do with risk.

The fact of the matter is the three key points that Rebecca made about concurrency and about price and about the flight test system, those are all interrelated. The key to getting the capability that we want and can have nationally and internationally is to recognize that interoperability and start giving fast turnarounds to things that are discovered, for example, in the flight test program.

We are empowered in ways that no other airplane program before this has ever had by information technology. The ability to discover something in the morning and have something going in in the way of a fix in the afternoon, whether it's shifting money around, moving it forward, moving it back, whether it's shifting technology, whether it's changing tooling or whatever, so the key is going to be recognizing the interrelationships between concurrency, price and flight test, and leveraging that by understanding how best to use the transparency and information technology that we have available. Breaking down as much as possible any organizational stovepipes between government and the contractor team, and among those individual organizations.

The other point I wanted to mention, or comment, is what Dr. Watts mentioned. I call it the big program magnet effect. The fewer large programs, in aviation in this case, that you have, everybody wants to hang their star onto the one that is left standing, and it's going to take a tremendous amount of discipline by the government and contractor program teams to shed any type of low or minimal value added activities that are ringing up the cash register for this program. As we go through this cycle, hopefully a rapid cycle of testing, fixing, delivering, getting out the training capability, getting out the operational capability, we've got to be very very careful and disciplined to not add on, oh yeah, I'll just put my little program, get a piece of that action. It applies inside government per Dr. Watts' comments. It really applies outside of government in the civilian contractor team. Be they large or small contractors.

Finally, I think from a requirements standpoint overall, U.S., international, certainly department of the Navy. I view this airplane and this program delivered as a utility infielder. Its flexibility in a changing strategic landscape. We mentioned before that a lot of these programs Dr. Watts mentioned were conceived in the Cold War, and we conceived of the Joint Strike Fighter after the Cold War. But you know, a lot of the scenarios, we

scenarios, we can all remember the charts about how great we were going to do and how wonderful low observability was. There were always two charts in any briefing. One was North Korea — thank you North Korea for staying in there as a good loyal enemy; and the other one was Iraq. Ah man, gone, don't have that. So maybe there are some others. But the key point is, with a shifting strategic landscape that sets the requirements for our overall weapon system capabilities, flexibility is tremendous, and this airplane, this system of systems, is going to give us tremendous capability nationally and internationally.

Thanks, and I look forward to your questions.

Lieutenant General Deptula: Thanks very much, Rebecca, for doing this. I think you'll all agree that so far this has been very illustrating in terms of the subject matter and it's great to see you, Dr. Watts, and Admiral McGinn. That's a great segue, when you were talking about information and utility of the aircraft. It really is a pleasure for me to be here and discuss how air power is evolving, specifically with respect to the F-35.

What I'm going to talk about is the how and why it needs to be understood in a context very much different, I think, maybe not very much different, but it's different from how we've become accustomed to viewing aircraft in the last century. We live in interesting times, because now you can use that to talk about the last century the industrial age of warfare, because we need to shed some of that old think.

I suspect that everyone suspects that I'll talk about stealth or weapons capabilities or maneuverability and how important these attributes are, and they are, but there's really another reason why fifth generation aircraft are very important and that's what I'm going to focus on this morning. And by the way, I'm not going to do any acquisition speak. There are plenty of experts out there. General Shackelford [Lt. Gen. Mark Shackelford, USAF military deputy for acquisition] testified yesterday over on the Hill so if you want to get into acquisition speak I'll divert you somewhere else. I'm going to talk about something a little bit bigger.

We're at a critical juncture in history, as I alluded to. We're at the center of information in war revolution, one where the speed of information, advancing technology, and designs of organizations are merging to change the way we operate and even think about crisis and conflict.

We don't know what's going to happen in the future. I think Admiral McGinn was spot-on when he talked about the versatility of the platform. As a matter of fact, we are horrible when it comes to predicting what the next conflict we're going to be in, and there are lots and lots of examples. The most obvious one that comes to mind is if anyone had mentioned to any of you on the 1st of September 2001 that in a month we would be flying B-2s bombing Taliban airstrips in Afghanistan, I think people would have looked at you and wondered what you were doing out on the street as opposed to in a hospital somewhere.

Anyway, this change that we have seen in terms of technology has dramatically shortened decision reaction times and it's reduced the number of systems it takes to achieve the desired effect. You all are very much familiar with, particularly standing in this building, the number of weapons, pilots and aircraft that it took to achieve a particular desired effect in World War II. Tens of thousands of bombs, thousands of aircraft, thousands of airmen to attack a single target. Today we can find, fix and finish a target from a single aircraft within single digit minutes. So this evolution of technology information and culture underlies really this ISR transformation we've been working on in the Air Force and it really has stimulated my motivation to move the Air Force and hopefully the other services and DOD away from the traditional segregation of operations and intelligence towards the integration of operations and intelligence.

What does this have to do with the F-35? Well this information in war revolution is also driving a rapid evolution of the aircraft in war changing, or rather breaking the old stovepipes of how we used to view the traditional roles of fighters, bombers, strike aircraft or ISR aircraft. In times gone by, technology of the day drove us to specifically design aircraft by mission type. Hence the fighter, bomber, ISR monikers we all grew up with. But that nomenclature is not reflective of the capabilities of modern aircraft. Today's technology enables mission capability on individual aircraft that we never dreamed of when aircraft mission designators were established.

The result is fewer aircraft performing more mission sets, missions where the information they gather becomes as important as the ability to engage the targets that information reveals. That's why fifth generation systems are so important. They aren't just fighters any more. Some of you have heard me describe the F-22 this way. It applies to the F-35. It's not an F. It's an FGAEAERCRAWACS-22 and 35. These are flying sensor platforms, information action nodes in an airborne network of seamless sensors and shooters, and that's where we're able to move and where we need to move in the future.

Every sensor that we build, where it makes sense, needs to also have shooter capability and every shooter needs to be a sensor, and they need to be completely integrated.

You've seen a couple of these charts before. I'm going to give a couple of twists to them.

The F-35 is much more than a fighter. A flying sensor, information action node that we may value more for its ability to penetrate denied airspace and collect information that can be acted upon — maybe not more so, at least as much as its ability to hit specific targets. It's the multispectral integrated infused data that's becoming critical as we reduce our numbers, but are still tasked with achieving the same effects across a battlespace that will become more and more contested in the future.

Integrated infused is the key. This is the technology that's critical to fifth gen systems. Now if you can't see that chart, what's up top there are federated and non-fused

information pieces. The way we used to treat information on legacy fighters. You have separate sensors and separate displays. Then we moved to federated and a correlated display system where we take the information from a variety of different sensors and show them on one display. To where we are with fifth generation information that's integrated in fused data. So not only is it displayed in one location, but the actions that may be required in conjunction with the integration, the data that's showing up, are automated to a degree that we haven't seen before.

So with the ability to rapidly collect, analyze, transmit, display and share decision quality information across a wide battlespace rapidly, and with an aircraft that can penetrate and survive against modern threats, we create options that our adversaries don't have, and a value that becomes more important than individual unit cost. Now don't misinterpret what I said there. Obviously cost is important, but we have to consider the value associated with the individual unit cost. Too often we still have this anachronistic approach that if one thing is less expensive than another similar thing, then obviously that's goodness. You have to take into consideration the associated capabilities that may be resident on the vehicle that has a higher price.

You saw this picture earlier too. All I want to use it with is to emphasize that it's integrated infused sensors suite. With that integration the F-35 can operate across the spectrum of challenges that we used to have in the past. Day, night, all weather, precision, sensor/shooter. It's a fighter sized networked ISR strike aircraft that can rapidly find, fix, track, and if we need to engage and destroy targets in almost any battle space.

Again, a little hard to see, but it's not just the radar, which hopefully you can tell from these examples, and most of you know it's quite impressive. If you're wondering, that near precision adverse weather self targeting capability enhanced with ATC, that's automatic target correlation for target recognition. In other words, what that means is by virtue of the shape and other information that is sensed, this set of sensors will be able to tell you what it is it's looking at and that obviously increases the ability to rapidly respond to targets of interest.

It can take a SAR map down to a very very fine degree, much more refined than legacy SAR images that you see here on the left.

It can add that SAR image to its ground moving target indicator real time, and display the difference between fixed and moving, land or maritime.

This is something we have to do today with several separate aircraft and a ground station. The F-35 puts this capability in the hands of every F-35 aircraft the joint force commander employs.

If you fold in its distributed aperture system on top of that, this is a set of sensors distributed around the aircraft that provide a 360 degree spherical infrared search and

track picture of the air, sea and land around the aircraft, yielding spherical situation awareness.

So the pilot doesn't have to consistently turn his head around or her head around to see what's going on behind. It reminds me of a time when I was flying in a William Tell competition in 1992. I went to the chiropractor to loosen up my neck so I could turn around and look back there. [Laughter]. That's a wonderful thing.

Then there's an electro-optical targeting system, a video camera, on top of that for even more refined target identification classification.

I think you're beginning to see that the information technologies available in the sensor suites and the integration thereof is really a key element of this aircraft. And then consider that each F-35 can share the data it collects with other fifth generation aircraft and you get a picture of what I mean by networked battlespace and how these aircraft are so much more than just a fighter or a strike aircraft or an ISR aircraft. They are a sensor, processor, distributor, kinetic, non-kinetic, shooter, penetrator, all wrapped up into one, bringing tremendous value to both the fight and the taxpayers of all the nations that are going to participate in this endeavor.

So think of how many different aircraft we'd have to acquire to perform all these tasks if we did them separately, which goes back to my issue of considering value for aircraft as opposed to just price.

The F-22 and F-35 are vitally important in order to maintain our collective allied asymmetric air power advantage. We like our definitions here inside the Beltway, and lots of think tanks and budget analysts are out there crunching numbers, and defense analysts address the environments, as you see here — regular, irregular, catastrophic and disruptive — and ask which one of these does the F-35 or F-22 address? And while each of these environments may be descriptive, they perhaps say more about us than they do our adversaries.

I would suggest to you that we need to view our security challenges through an additional set of lenses — permissive, contested, and denied battlespace. Battlespace in which we must be prepared to succeed regardless if it's against regular, irregular, disruptive or catastrophic threat, or maybe all four of them simultaneously.

So which of our legacy aircraft can operate effectively in all three of these environments? The answer is pretty simple. Only our fifth generation aircraft can execute operations across the full spectrum of permissive, contested and denied battlespace, and that's why we need the F-35 in the numbers that we have programmed.

That's not the only reason. We also have, at least in the Air Force, to a degree perhaps more so than the other services, a geriatric fighter force. We are flying fighters that are 30 years old. So the F-35's not just a nice to have, it's something we have to have if we

want to recapitalize and maintain the capabilities that exploit the air domain in the future.

Thanks very much for your attention, and I look forward to the discussion.

Dr. Grant: General Deptula, thanks very much, and thanks to all our panelists. I certainly could ask questions for quite a little while going forward, but I'd like to open it to the floor.

Question: Bill Segar, Defense Technology International.

I keep going back to a statement that Rebecca started with which is that there's no fundamental problems with the program. What I'd suggest is that if all the Pentagon analysts are more or less right about finances, and the fairly fragmentary indicators of our pricing in the early LRIP [batches], which are going to be very unstable anyway, if the Pentagon analysts are right or even half right, then I think you've got a financial issue, an affordability issue that is very very serious. Because from the ground up this was intended as a numbers airplane. It's the affordability airplane that keeps the forces up to their numbers while delivering that stealth quality. Barry told us about the history of stealth aircraft.

So isn't there a risk that if the Pentagon analysts are right and the optimists on the other side are not right, which they haven't been so far, that this is going to turn the Air Force into something like a cuckoo chick that's going to push every other program out of the nest as it's already done with NGB and F-22 in order to remain funded at the level it needs to remain funded at to avoid a very very sharp decline in production rates?

The same issue applies to partners. They're looking for an aircraft that they can afford in numbers to make a realistic air force out of it. They're already down from 8100 F-16s, most of those partners say, a typical partner is looking at 48 or so F-35s. If it goes any further they're looking at a fighter force that looks like the air force is being two forces. I think that's causing some qualms. I think it's definitely been the subject of some discussion internally in the Netherlands. I foresee that coming up again.

I guess the question is what is the impact of, if the Pentagon analysts are right, what is the impact? How can the Air Force, for instance, afford 80 aircraft and [inaudible] manually and afford to get anything else?

Dr. Grant: Let me make a couple of quick points and then maybe others on the panel.

I just want to be really clear, what I said was I quoted Dr. Carter who said, and I'll quote him again, "None of these reviews discovered fundamental technological or manufacturing problems with the JSF program or any change in the aircraft's projected military capability." So to clarify on that point.

I think your question is what if the Pentagon is right. I would say two things about that. First, these estimates are bounded pretty clearly to the near term. The entire price curve is going to come down and flatten and I think that what we're seeing is that as we go forward, even if Pentagon estimates remain slightly higher, two important things have happened. One, the Pentagon has funded conservatively into of those estimates; second, the negotiated prices are not coming up to those estimates. And I'm going to add a third, which is we would in fact expect to see all of these converge significantly at the juncture of moving out of the later [hour blots] or into economic order quantity production.

So this is an estimate about getting through the next short period of time. There is no one in the Pentagon who has said that we're going to resolve this down to one number. To me a key point is that the contract negotiated prices are coming in lower.

I'd like to let Dr. Watts or anyone else on the panel who wants to to comment on price and affordability and the big picture.

Dr. Watts: I hoped I wouldn't have to talk about this. Look, in response to your question if the unit prices continue to increase out of control there are obviously going to be problems both with the partners and with the services. I hope that Rebecca is right, that they have funded at this point fairly conservatively and there aren't going to be any further large explosions in the program price, but in some cases they're going to go through lot by lot and negotiate prices with the contractor and that's in the future.

Vice Admiral McGinn: I'm reminded of the old expression, "I'm a lot better at fixing problems that I know about." I think this brings in the transparency benefit. There are open hearings up on the Hill. There's sharing across the board. This is a problem, no doubt about it, but it's a problem that I think the collective team, government and industry, is going to be a lot better at fixing because of that transparency. And as I mentioned before, this synergy, if you will, between concurrency, price and flight test program is, if you do it wrong it's a problem. If you do it right, it's a solution. I think that the kind of scrutiny that the program is getting at this stage because of these professional differences of opinion, differing assumptions, is going to turn out to be a very good thing.

I would also say there is a set of things that we don't know. That is the results of the flight test program, which means that the scrutiny, that transparency, the speed of change of designs or what have you, needs to be done very very carefully. So I think there's a lot more known about this program at this stage than has ever been known about this scale of program in the past, certainly aviation program. And I think that the flight test program is going to be, it's planned now and will be conducted in a way that will be looking at the big unknowns as quickly as possible to address the price and concurrency issue, and it will also have flexibility in it to look at other things as more is learned about the actual flight test vehicles.

Question: I wanted to ask [inaudible] because you have to be careful about what

numbers you look at, current dollars, then year dollars. What type of figures should we be looking at that are the more accurate figures? And under what scenario would the F-35 be more expensive than the F-22?

Dr. Grant: I wish this was Congress and I could say I'll take that for the record and get back to you. But as it is. [Laughter].

As always, once you get down to discussing the numbers, you have to be very careful in doing that. I think we see a couple of things. One, we talked for a long time about a price that was in '02 dollars. We are now talking about the price, and Dr. Watts mentioned in his presentation, it's this range of the 95 to 100 and is in '09 dollars. So what you see in that are two factors. One is the pure budget accounting inflationary piece of that which is a component. You have to remember that that's there, but the other piece of it is the growth in program cost that has caused the Nunn/McCurdy breach.

So we need to remember that, to my mind, I'll just give a personal opinion here. We don't want to talk about '02 dollars any more. For a long time that was how it was done. Those were the official program documents. There was very little — If the Pentagon doesn't release SARs [selected acquisition reports] and other things then you can't move the discussion along. So you had a case where everybody talked '02 dollars for a long time, and then suddenly bang, here we are with both cost growth and inflationary growth.

So I think the range that we're looking at now is exactly as Dr. Watts mentioned. What scenario does this become more expensive than F-22? I think a way to broaden that is saying are we still within the ball park of what we pay for comparable aircraft? Except, of course, that there really isn't a comparable aircraft.

F-22 obviously is there in a way, but I don't know that you can look at F-22 costs given the small number of the program and make a real comparison. If you stretched it out right across KPPs [key performance parameters] you would find there are some differences. Some of them were talked about by the last two panelists. With F-35 it does have some different planned and in some cases more advanced technologies in the ground attack role. So it's really hard to compare.

When does it become more expensive than an F-22? It was last year. But that was because of the small quantity. So it's not a relevant comparison to say hey, this is the high figure that these first very few aircraft cost when you're dividing this much of the production and development out across them.

I think what we want to look for is the trend that will keep that aircraft focused close to the admittedly conservative [cape] estimate, or go back to what I said kind of sometimes through the presentation which is let's look when we get to economic order quantity at the negotiated price.

So as we see that the negotiated price is coming in lower early on, then that is as sound an indicator as we have right now that there is, as Admiral McGinn pointed out, transparency in the cost and that that is being managed.

That was an excellent question and I hope that answers at least a little bit.

Question: Phil Gordon, a question for General Deptula.

Sir, with respect to the concurrent ISR capabilities of the F-35, do you see the employment doctrine and the command and control systems and thinking, is it taking advantage of that?

Lieutenant General Deptula: It's an excellent question and I would say yes, by virtue of the fact that I highlighted for you the recognition of the increased information capabilities that are provided by this aircraft.

Now the second part of the implication of your question is really do we have a ways to go before we get to the position where our command and control architectures can capitalize on the enhanced capability of these systems? I would say yes, we still have a long way to go because our command and control architectures are based on the previous generation of capabilities. So we have a long way to go yet.

Do we recognize that we have to change the way we do command and control? Yes. Do we still have to improve our command and control architectures? Yes.

Question: [Inaudible]. Do you see the U.S. Air Force will perhaps consider a different variant of the technology that will make use of other type of aircraft [inaudible]? The JSF [inaudible], very expensive, very capable, full range of [inaudible], but [inaudible] aircraft has really half the capability, [inaudible] certain niche?

Lieutenant General Deptula: We're already there. We are going to retain — don't forget, when F-35 comes on board we're not getting rid of everything else. This is, as we bring this aircraft on board we will still retain a portion of the previous generation aircraft. We plan on keeping, I think now we're down to 177 F-15s but they'll have new radars. They won't be able to operate in denied airspace, but they will be able to perform certain air defense functions. We have a set of remotely piloted aircraft that we operate today and that we're working on a next generation remotely piloted aircraft that when we go back to the aircraft we have today can only operate in permissive airspace. If you put them in any of those other circumstances, they'll start falling from the sky like rain.

We have a panoply of capabilities, and in the United States military that's very very important because if we want to retain our role as the world's sole super power we need to be able to operate effectively across the spectrum of operations and not just focus on one particular piece.

Vice Admiral McGinn: I would say the same thing is true in the Navy and Marine Corps. I mentioned that it was intended to complement the F/A-18EF. The whole idea is if you start talking about more daunting environments, denied airspace or whatever, you're going to lead with your best and it's going to be your best from your whole tool kit of capabilities. So if it's denied because of some very very tough fighter opposition or some precise nodes of command and control and enemy air defense, you're going to be putting in your stealthiest capabilities, the ones that have the ability to stand off the longest. They could be unmanned, it could be manned. F-22, for example, comes to mind in certain scenarios. So it's going to be this synergistic effect not just among F-35s, but among the whole coalition capability.

Question: [Inaudible] from the British Embassy.

I just wondered if you talked about the multi-role aspects of the system, do you see it as a cyber capability [inaudible] cyber [inaudible] capacity built into that? Or is it going to remain a system of systems that then sits alongside of cyber [inaudible]?

Lieutenant General Deptula: Yes. [Laughter]. That's my short answer.

Yeah, absolutely. And as Admiral McGinn and Rebecca have indicated, and is in fact, we're going to be producing this thing out until 2035. So we haven't seen the apps that will be enabled by this particular aircraft. That's one of the beauties of the design. It's plug and play. Not just cyber, but the potential for application of directed energy technologies as those advance. So a very very versatile platform.

Question: General, you mentioned how many aircraft you would have to buy to do all these other functions. Has there ever been a metric that weighs what an F-35 is equivalent to in terms of fourth generation aircraft, or what the cost avoidance is in terms of numbers of airframes?

Lieutenant General Deptula: Specifically, no. And I would tell you why, and that's because it depends. It depends upon the scenario, it depends upon the conditions of employment, it depends upon the location, it depends upon which particular era you're talking about — 2016, 2020, 2030, 2035. So when we get into these direct comparison things, they can be done for illustrative purposes, but they need to be very highly defined in the context of what. It is not a simple answer. I think that's — It really depends.

Vice Admiral McGinn: Obviously the services and Department of Defense do a lot of classified analyses in which they will make some assumptions about specific scenarios and then they'll do comparisons. Force capability, force structure comparisons. You could derive from that equivalencies, if you will, of one type of capability, one type of airplane versus another. But as General Deptula said, it really is highly dependent on the assumptions you make about that scenario. What are the missions that are required by the combined force commander? What are the enemy countermeasures to those

missions? And what do you have available to you in terms of capabilities that can be applied to accomplish that mission?

You could do these types of comparisons and put them in glossy brochures and all that kind of stuff, but they would be very very dependent on what your assumptions were.

I'd like to make a point talking about concurrency, price, and flight test programs.

Flight test programs, first of all let me say that controversy sells. We all love to hear the "I gotcha" story or that something was a surprise. The bigger, the more competent the organization that is "surprised" the better the story is.

Flight test programs are like that. I remember back in 1998 we had the Super Hornet heavily into flight test, and there was this so-called wing drop phenomenon. I'll tell you what, this town went crazy. Everybody thought that was the end of life for the EF. For those of us who knew a little bit about test flying and about test programs and from a program office standpoint it was okay, we discovered this, we were right there with the contractor, we've developed a fix, but it was a huge story. I just want to inoculate everybody here today not with SARS virus but with F-35 flight test virus. There are going to be some things that are going to be discovered. Flight test programs are there because we don't know everything about a program and they don't just go like clockwork. There are going to be things that will be discovered. There will be bad news, but I very seldom have seen bad news that is so bad that it's a show stopper, either from a price standpoint or from a capabilities standpoint.

We've got a very very competent defense aerospace industry in this country and really with our coalition partners, and I can't think of too many problems that can't be solved. So just be aware that sure, there are going to be some things discovered in the flight test program on all three variants. But I would reserve your burning headline conclusions. I'm not just talking go you guys in the front row here, either. Your burning headline conclusions that it's the end of the program or this is really huge or what have you.

Dr. Grant: Admiral McGinn, thank you. On that note we will wrap up our panel this morning. Thanks to General Deptula in abstentia, to Dr. Watts, and to Admiral McGinn for a superb set of presentations.

END TEXT

[**General Billy Mitchell Institute for Airpower Studies Web Site**](#)

[**Mitchell Papers**](#)